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Nieuwbeerta, Paul; McCall, Patricia L.; Elffers, Henk; Wittebrood, Karin

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Neighborhood Characteristics and Individual Homicide Risks

Effects of Social Cohesion, Confidence in the Police, and Socioeconomic Disadvantage

Paul Nieuwbeerta

Netherlands Institute for the Study of Crime and Law Enforcement

Patricia L. McCall

North Carolina State University

Henk Elffers

Netherlands Institute for the Study of Crime and Law Enforcement

Karin Wittebrood

Netherlands Institute for Social Research/SCP

This study tests hypotheses on the relationship between characteristics of neighborhoods in the Netherlands—their socioeconomic disadvantage, social cohesion, and residents' confidence in the police—and the likelihood of homicide victimization. These hypotheses are derived from social disorganization and strain/deprivation theory, but have rarely been tested at the neighborhood level. Furthermore, examining the validity of these hypotheses in the Netherlands, a country with relatively low homicide rates and geographically equal distributed social circumstances, provides a stronger test for the theories. Data from the Dutch Homicide Monitor 1996 to 2003, a national database of all homicides and their characteristics, are merged with data on characteristics of neighborhoods. Hierarchical logistic modeling is used to analyze the nested data. The results show that neighborhood social cohesion and socioeconomic disadvantage affect homicide risks, whereas indicators for confidence in the police do not have an effect. Implications for policy making and further theory development are discussed.

Keywords: *homicide victimization; social cohesion; hierarchical linear modeling; the Netherlands*

Authors' Note: Preliminary ideas for this article were presented at an NCOVR workshop organized by Steve Messner on "Violent Crime in Geographic Context: Multi-level Analyses of Areal Units" held at the State University of New York, Albany, April 15 to 16, 2005. We thank the participants of that workshop for their encouragements and helpful suggestions. Please address correspondence to Prof. Dr. P. Nieuwbeerta, Netherlands Institute for the Study of Crime and Law Enforcement, Wassenaarsweg 72 - 2333 AL Leiden, Netherlands; phone: +31 (0)71-527-8538/8527; fax: +31 (0)71-527-8537; e-mail: pnieuwbeerta@nscr.nl.

Homicide researchers have long studied the question of what characteristics of different geographical areas—such as countries, states, and cities—are associated with high rates of homicide and place its residents at different risks of becoming a victim of homicide. Most of these studies focus on the relationship between the social structure of the geographical areas and homicide rates (see for an overview: Land, McCall, & Cohen, 1990; Parker, McCall, & Land, 1999). A focus on the structural perspective is based on the premise that the killing of one person by another are not simply idiosyncratic individual acts of violence. Rather they are presumed to be “social acts” that are distributed in patterned ways across social space (Messner & Rosenfeld, 1999, p. 27).

The way variations in community social structural context relate to variations in homicide rates is central to two main theoretical perspectives in criminology. One of the most important is known as social disorganization theory. It argues that characteristics of the social structure affect a community’s formal and informal social control mechanisms and, therefore, its ability to control crime. The key to social disorganization theory is the idea that social and economic changes in a community lead to the deterioration of group solidarity and to a breakdown in social control mechanisms that keep crime in check. Low levels of social cohesion in a community are related to high risks of homicide. Another important perspective, known as the strain/deprivation theory, emphasizes the effects of limited economic opportunities on feelings of resentment, diffused aggression, and the potential for violence. High levels of economic deprivation in a context are hypothesized to lead to higher homicide risks. Numerous empirical analyses have examined the relationship between levels of economic deprivation and social control in geographic areas and the homicide rates of these areas.

In this article, we place ourselves in the tradition of research explaining geographical variation in homicide rates by social structural characteristics (Messner & Rosenfeld, 1999). Building on these theories and previous empirical studies, we test hypotheses related to the relationship between levels of social disorganization and deprivation in neighborhoods across the Netherlands and their respective homicide rates around the year 2000. By doing this, we build on previous studies, but we also make important contributions.

First, most studies of the relationship between social structure and homicide rates examine relatively large geographical units, for example, standard metropolitan statistical areas, counties, or cities (see Parker et al., 1999). These studies neglect the conceptual arguments of social disorganization and strain/deprivation theories that the effects of contextual characteristics are realized at lower levels of social interaction, that is, at the neighborhood level. Relatively few studies examine homicide in such small geographical units as the neighborhood and, those that have, examine neighborhoods within single metropolitan areas. Important neighborhood-level studies of homicide have been done in the cities of St. Louis (Kubrin, 2003), Chicago (Sampson & Morenoff, 2004), New York City (Galea, Ahern, & Karpati, 2005), and Manhattan (Messner & Tardiff, 1986).

Second, most studies of social structural context and homicide focus on total homicide rates rather than disaggregated homicide rates. Extant literature has established how homicide offending varies in terms of motive, characteristics of the victims and offenders, their relationships, settings, and circumstances. Given such variation, it is possible that different types of homicide have different social correlates, patterns, and causes (see Flewelling & Williams, 1999; Williams & Flewelling, 1988; Wolfgang, 1958). Therefore, some social forces may influence many types of homicide, whereas others may be limited to specific types (Kubrin, 2003, p. 140). Very few homicide researchers have examined the relationship between social structural characteristics of neighborhoods (including economic disadvantage and social control) and different types of homicide offending (Kubrin, 2003; Miles-Doan, 1998).

Third, most homicide studies focusing on neighborhoods have only indirect measures of social disorganization.¹ Variables, such as racial heterogeneity, unit population size, and percentage of divorced persons have been used as indicative of disruption in community social disorganization (Kubrin, 2003). More detailed and direct indicators of levels of social control at the neighborhood level are developed (Sampson & Raudenbush, 1999), but have rarely been applied to research on homicide (for an exception, see Sampson & Morenoff, 2004).

Fourth, we extend the U.S. research tradition by exploring the relationship between social structure and homicide and test whether this relationship also holds across non-U.S. neighborhoods. In addition, we study the Netherlands neighborhoods nationwide—thus, both metropolitan and nonmetropolitan areas in this Western European country are examined.

The Netherlands has relatively low homicide rates and relatively small differences in social structure across cities and neighborhoods. Nevertheless, enough variation exists to determine the extent that social disorganization and strain influence different types of homicide offending across the Netherlands' neighborhoods. Data from the Dutch Homicide Monitor 1996 to 2003, a national database of all homicides and their characteristics, are merged with data on characteristics of Dutch neighborhoods to test hypotheses derived from social disorganization and strain theories. The neighborhood data include detailed measures on economic deprivation and social cohesion as well as other control variables.

Theoretical Background and Hypotheses

Many studies have been published that examine the contextual effects of characteristics of geographical units, among which neighborhoods, on homicide victimization risks. In these studies, three neighborhood characteristics are assumed to play a central role: (a) social cohesion, (b) confidence in the police, and (c) socioeconomic disadvantage. From current theories on homicide, all three characteristics can be assumed to have important and distinct effects on a citizen's risk to be murdered.

Social Disorganization and Social Cohesion

The idea that neighborhood social cohesion is of importance for crime is mainly drawn from the work of Emile Durkheim (1897/1966), and the classic social disorganization model (Shaw & McKay, 1942/1969), which assumes that strong informal social control in neighborhoods is an important mechanism for regulating conduct and interpersonal disputes (Morenoff, Sampson, & Raudenbush, 2001; Sampson, Raudenbush, & Earls, 1997; Silver & Miller, 2004). Along this line of reasoning, various scholars have suggested that neighborhood informal social control and social cohesion are important for keeping crime in check. As defined by Bursik (1988), social disorganization refers to the inability of a community structure to realize the common values of its residents and maintain effective social control. Key to social disorganization is the idea that structural barriers impede development of the formal and informal ties that promote the community's ability to solve common problems. A breakdown in social control mechanisms produces conflict and increasing potential for crime. Structural variables such as racial heterogeneity, unit population size, population change, and social cohesion have been taken as indicative of the level of community social organization.

A classic hypothesis regarding the nature of the relationship between social cohesion and homicide assumes that neighborhoods with limited social cohesion have less collective efficacy (Sampson et al., 1997) and informal social control that are important in maintaining public order (Messner, Baumer, & Rosenfeld, 2004; Rosenfeld, Messner, & Baumer, 2001; Vélez, 2001). Some have argued that this also results in difficulties in securing an adequate share of various public services, such as formal police protection (Baumer, 2002). Therefore, it is often hypothesized that neighborhoods with low social cohesion have less access to (in)formal control to prevent (lethal) violence. This brings us to our first hypothesis: *The lower the social cohesion in a neighborhood, the higher the homicide rate in that neighborhood (H1).*

Confidence in the Police

Another neighborhood characteristic that can be assumed to affect the probability that people become victims of (lethal) violent crimes is the confidence in the effectiveness of the police in a neighborhood (Messner, Deane, Kubrin, & Stucky, 2005). An assumption of the rational choice/deterrence perspective is that a strong police presence will reduce crime rates as would-be offenders adjust their perceptions of the probability of arrest. This is specific to the notion of general deterrence. In addition, by using aggressive policing practices, the police are more likely to apprehend fugitives and persons involved in crime and, thereby, more likely to take would-be criminals off the street. This is specific deterrence. Finally, and especially relevant in the Netherlands, more effective (proactive) police play a substantial role in mediating small conflicts—for example, between spouses—and thereby prevent

small conflicts from escalating into more serious violence, for example, aggravated assault or murder. Homicide rates can, therefore, generally be assumed to be higher for neighborhoods with a less active and effective police force than for similar neighborhoods with a more effective police. The resulting hypothesis is thus that *the lower the confidence in police effectiveness in a neighborhood, the higher the homicide rate in that neighborhood* (H2).

Socioeconomic Disadvantage

A third contextual characteristic that can be assumed to affect the homicide rate is the level of socioeconomic disadvantage. The disadvantage/homicide relationship has been empirically tested and corroborated across various levels of analysis—including nations, metropolitan areas, cities, and neighborhoods. Based on Merton's (1938) classic strain theory, contemporary homicide researchers argue that limited economic opportunities and deprivation are accompanied by feelings of injustice and resentment (Agnew, 1992; Messner & Golden, 1992). As economically deprived persons become aware of their limited economic resources and grow resentful of what they perceive as an unjust system, so grows their potential to violence. This hypothesized link between economic conditions and violence should be manifested especially in extremely economically disadvantaged neighborhoods (Hannon, 2005; Krivo & Peterson, 1996; Kubrin & Weitzer, 2003). It can thus be hypothesized that *the greater the socioeconomic disadvantage in a neighborhood, the higher the homicide rate in that neighborhood* (H3).

However, an alternative argument could be made regarding the mechanisms responsible for the relationship between socioeconomic disadvantage and homicide rates. The relationship may be indirect and mediated by neighborhood social cohesion as well as confidence in police effectiveness. Sampson et al. (1997) found that concentrated disadvantage was mediated by collective efficacy in its effect on interpersonal violence in Chicago neighborhoods. Therefore, we hypothesize that social cohesion mediates the effect of economic deprivation on homicide offending.

The link between neighborhood levels of socioeconomic disadvantage and social cohesion is based on the residents' limited material and political resources in disadvantaged neighborhoods that are argued to lead to a lower capacity for social organization. This is the classic thesis on which the social disorganization theory has been developed (Shaw & McKay, 1942/1969; see also Bursik & Grasmick, 1993) and which is confirmed in recent research. Residents of neighborhoods with extreme socioeconomic disadvantage have less social contact with each other (Bellair, 1997; Morenoff et al., 2001; Sampson et al., 1997) and participate less in local organizations (Sampson & Groves, 1989). Therefore, part of the hypothesized effect of neighborhood socioeconomic disadvantage on homicide offending is explained by differences in social cohesion in these neighborhoods.

The same might be the case with the confidence in the police. According to a study by Sampson and Bartusch (1998), neighborhoods of concentrated disadvantage display elevated levels of legal cynicism, dissatisfaction with police, and tolerance of deviance unaccounted for by sociodemographic composition and crime-rate differences. These findings are in keeping with general theories on anomie, strain, and subcultures of crime, and with the work of Anderson (1999) and Baumer (2002). Because of high levels of poverty and unemployment and limited labor market opportunities, residents of socioeconomic disadvantaged neighborhoods, especially youth and immigrants, are felt to be alienated from the general norms of society. In neighborhoods of this kind, alternative norms and codes of conduct emerge (Anderson, 1999; Baumer, 2002). The residents of disadvantaged neighborhoods can thus be expected to have less confidence in the police (effectiveness) that leads us to our final hypothesis: *The effects of socio-economic disadvantage on homicide in neighborhoods are mediated by the effects of its residents' social cohesion and confidence in the police* (H4).

Data, Measurement, and Method

Various data sources have been used in this study to test the above-formulated hypotheses. To begin, we use the Dutch Homicide Monitor data (Nieuwbeerta, 2005), an ongoing data collection effort that includes the characteristics of incidents, victims, and offenders of all murder and manslaughter cases in the Netherlands since 1992 (see also Leistra & Nieuwbeerta, 2003). According to the Netherlands' criminal code, manslaughter relates to crimes in which the perpetrator has deliberately taken the life of the victim and murders to cases of whether manslaughter was premeditated. A case is defined as a manslaughter or murder based on the qualification of the crime given by the public prosecutor's office or, in cases where prosecution did not or has not yet taken place, for example, in unsolved cases, it is defined as a murder based on the police's assessment of the case.

To construct the Dutch Homicide Monitor, various sources of information were used. These sources that overlap and complement each other include the following: the police (i.e., murder and manslaughter files of the National Recherche Informatiedienst [National Detection Information Division] and all 25 regional police forces), the justice department (i.e., the database of the public prosecutor's office and the criminal record register maintained by the Ministry of Justice), and the media (i.e., all press reports about murder and manslaughter in the Netherlands published by the *Algemeen Nederlands Persbureau* ($N =$ approximately 16,000) and annual summaries of homicides from Elsevier, a weekly magazine). In this analysis, we use only information on the age and sex of the victim, the type of homicide (based on victim-offender relationship), and the victim's residential neighborhood.²

In total, there were 2,500 homicide victims of homicide in the Netherlands in the years 1996 until 2003. On average, this approximates 230 victims per year with an

average homicide rate of 1.6 per 100,000 inhabitants. The homicide rates have declined slightly during the data collection period (for longer homicide trends in the Netherlands, see Nieuwbeerta & Deerenberg, 2005). In the earlier years, there were annually about 250 murders (about 1.7 murders per 100,000 inhabitants).³ In more recent years, the number of victims declined to approximately 220 per year (about 1.5 per 100,000). Of the 2,500 murder victims, 71% were male and 29% were female. In the Netherlands, during this time frame, on average, women's risk for homicide is 1.0 per 100,000 women, whereas for men, this risk is 2.3 per 100,000 men. This distribution between men and women is approximately constant over all years.

The Dutch Homicide Monitor also includes information on the social and demographic situation of respondents. The four-digit zip codes of the respondents' home addresses are included so that we know the neighborhood in which they live. The neighborhoods are thus operationalized as zip code areas with 3,990 zip code areas in the Netherlands (as designated in 2001).⁴ Even though these geographical units have primarily been designed as administrative units by the postal services and are not an optimal way to define neighborhoods (e.g., some zip code areas cover a developed as well as a rural areas), they are the best nationwide classification of neighborhoods in the Netherlands and have been successfully used in studies examining neighborhood effects (e.g., Bernasco & Nieuwbeerta, 2005; Van Wilsem, 2003; Wittebrood, 2000, 2004). The average population size in a zip code area is 4,907 and the average number of households is 2,104.

For data on the neighborhoods where respondents live, we use supplementary sources: the Residential Environment Data Base (Woonmilieudatabase), the Residential Needs Survey (Woningbehoefteonderzoek), and the Police Population Monitor (Politiemonitor). The Residential Environment Data Base is a compilation of official data on neighborhoods from various agencies such as Statistics Netherlands, various municipalities and provinces, and various ministries. The Residential Needs Survey is conducted every 4 years among a representative sample of the population on their residential experiences and needs (Ministry of Housing, Spatial Planning, and the Environment, 2003). The Police Population Monitor is a nationwide computer-assisted telephone interviewing questionnaire survey on subjects related to public safety and crime in the Netherlands. This survey is conducted every 2 years since 1993, with 75,000 respondents (older than 14) on average. The neighborhood data from these files are merged with the data from the Dutch Homicide Monitor using the four-figure zip codes included in all three of the files.

The analyses are conducted on an individual-level data file along with neighborhood-level contextual variables. Because every inhabitant of the Netherlands is theoretically at risk of homicide, every resident is included. However, we had to restrict our analyses to those residents in neighborhoods for which data on the necessary contextual variables are available. Of the 16.1 million residents living in the Netherlands in 1996, a small number was excluded because we did not have reliable information on the characteristics of these neighborhoods. (Most of the neighborhoods or zip code areas that could not be

included in the analyses are in rural or industrial regions with very few inhabitants.) This resulted in a data set with 16.1 million residents living in 3,979 neighborhoods.

Dependent Variable: Individual Risk of Homicide

In this study, we assume all residents living in the Netherlands are at risk of becoming a homicide victim. We consider respondents who were homicide victims in the town where they live, because neighborhood characteristics are assumed to especially influence incidents that occur in one's own environment. The variable indicating whether a citizen was (1) or was not (0) murdered serves as dependent variable in our study. On average, 230 persons (or 1.6 per 100,000 of residents) are murdered each year.

Types of Homicide

As a point of comparison and to examine the extent to which differences in homicide risks are correlated with neighborhood characteristics, we consider the type of the homicides that is committed. In this article, the murders are classified on the basis of the relationship between the perpetrator and the victims and the context in which the murder took place. Four types of homicide are analyzed as follows: murders in the family domain (partner killings and other murders in the family⁵), murders in the criminal domain (robbery with murder and other murders committed during commission of a crime), murders occurring during arguments, and other murders (including sexual murders outside the family).

About a third of the murders are in the family/relational domain—and partner murders comprise the largest proportion of them (20% of all types of murders). About 20% of the homicide victims were killed during the commission of a felony, such as robbery, or were killed while involved in a criminal act—as a party of a drug transaction, for example. That is, the perpetrator and/or the victim were involved in criminal activities and these activities resulted in murder. Most of these cases are related to drugs, such as drug addicts who murder each other, addicts who murder their dealers, or drug dealers murdered during drug transaction. The settling of accounts in the criminal world is also included.⁶ Another large category—about 20%—is composed of murders occurring during arguments. Of the remaining murders solved by police, about 15% are classified as “other.” Murder cases that have not been solved by the police—that is, 20% of all homicide cases—have been classified into a separate category.⁷

Resident and Victim Characteristics

In our analyses, we also examine a limited number of individual characteristics that have been shown in previous studies to have an important effect on the likelihood of becoming a victim of homicide. We examine residents' and victims' combined features of sex and age.

Neighborhood Characteristics

We have formulated four hypotheses on the effects of three neighborhood characteristics on the likelihood for residents living in these neighborhoods of being murdered. These pertain to the neighborhood's social cohesion, residents' confidence in police effectiveness, and the neighborhood's level of socioeconomic disadvantage. Several methods and data sources are used to measure the neighborhood characteristics.⁸

Data from the 2002 Residential Needs Survey are used to measure the extent of social cohesion in neighborhoods. Nine statements are presented to the respondents that give an indication of the cohesion in the neighborhood. The respondents indicate the extent to which they agree with these following statements: (a) I feel an attachment to this neighborhood, (b) I feel at home in this neighborhood, (c) I have a lot of contact with the people who live next door, (d) I have a lot of contact with other neighborhood residents, (e) I feel responsible in part for the neighborhood being a pleasant place to live, (f) people are nice to each other in this neighborhood, (g) I live in a pleasant neighborhood with a sense of solidarity, (h) people in this neighborhood hardly know each other, and (i) I am satisfied with the composition of the population in this neighborhood.

Following the example of Raudenbush and Sampson (1999), we conducted an econometric analysis to derive a score on social cohesion for each neighborhood (see also Goudriaan, Wittebrood, & Nieuwebeerta, 2006). The aim of this type of analysis is to measure a characteristic of ecological units, in this case neighborhoods, on the basis of survey data and to aggregate the data over responses to multiple items given by various respondents within each ecological unit. We assume that the internal consistency of an area-level scale not only depends on the correlation between the items, the number of items, and their extent of difficulty but also on the agreement between the respondents within the area and the size of the sample for each area. In practice, scale values for the neighborhoods can be calculated using a multilevel regression analysis with three levels: items, respondents, and neighborhoods. The predicted values estimated from the neighborhood-level regression are the new social cohesion scale values. The measure of social cohesion that we constructed has a reliability of .80, and the scale is centered over the entire sample (the average is zero) with a range in values from -0.56 to 0.49 (see Table 1). A higher score indicates less social cohesion in the neighborhood.

To measure the confidence in the effectiveness of the police in a neighborhood, survey questions from the Police Population Monitor are used.⁹ Each respondent ($N = 317,954$) is asked to assess the extent to which they agree or disagree with the following 12 statements on the functioning, the conduct, and the availability of the police: (a) the police protect the people of this neighborhood, (b) the police have good contact with the residents of this neighborhood, (c) the police respond to problems in this neighborhood, (d) the police have an efficient approach here, (e) the police in this neighborhood are doing their best, (f) the police are not tough enough here, (g) the police do not intervene here, (h) you don't see the police often enough here, (i) they

Table 1
Descriptives of Neighborhood Characteristics (N = 3,979 neighborhoods)

Variables	Mean	SD	Minimum	Maximum
Socioeconomic disadvantage ^a	0	1.44	-2.77	5.40
Low social cohesion	0	0.18	-0.56	0.49
Confidence in police	0	0.09	-0.33	0.48
Percentage non-natives ^a	0	1.26	-1.31	6.69
Residential mobility ^a	0	0.52	-1.22	2.27

a. Centered and divided by 10.

don't get out of their patrol cars often enough here, (j) they are not easy to approach here, (k) the police in this neighborhood don't have enough time for all kinds of problems, and (l) they don't come quickly when you call them. To construct a measure in each neighborhood for the confidence in police effectiveness, an econometric analysis was conducted as described above for the social cohesion scale. The reliability of the scale is .83, and like the social cohesion scale, it is centered over the entire sample (the average is zero) with a minimum value of -0.33 and a maximum of 0.48 (see Table 1).

The neighborhoods' socioeconomic disadvantage is measured using four indicators from the 1998 Residential Environment Data Base, that is the percentage of households with an income less than the minimum of 6,000 euros,¹⁰ the percentage of households headed by an unemployed person, the percentage of households whose head receives a benefit from the welfare department, and the percentage of one-parent families with children who are minors. To determine a socioeconomic disadvantage score for each neighborhood, the scores on the four indicators are summed and weighted by the score from their factor loading.¹¹ Despite the factor weighting, one could interpret this scale as generally reflecting the extent and the percentage of socioeconomic disadvantaged households among all households in the neighborhoods. The socioeconomic disadvantage scale has a minimum value of zero (no economic disadvantage) and a maximum of 81.7 (high level of economic disadvantage) with an average of 27.7. For the analyses however, the scale is centered over the entire sample and divided by 10, so that the minimum is -2.77, the maximum is 5.40, and the average is zero (see Table 1).

In addition to the three neighborhood characteristics on which our hypotheses are formulated, two other neighborhood characteristics have been included in the analyses as control variables, that is, *ethnic heterogeneity* and *residential mobility*. By including these characteristics as control variables, we obtain a better estimate of the unique effects of the influence of the neighborhood characteristics on which we have formulated our hypotheses. The percentage of non-Western immigrants is used as an indicator of the ethnic heterogeneity in a neighborhood.¹² In the neighborhoods included in this analysis, this percentage varies from zero (represented by 30% of all

the neighborhoods in the Netherlands) to 80%. On average, 13.1% of the neighborhood residents are non-Western immigrants. For the analyses, the scores are centered by subtracting the overall mean and they are divided by 10, so that the minimum is -1.31 and the maximum 6.69 (see Table 1). The residential mobility in a neighborhood is defined by the percentage of the total population who moved into the neighborhood in that year. Residential moves within the neighborhood are not counted. In our data, the scores range from zero to 34.9% and the average is 12.2%. The scores are also centered and divided by 10 resulting in a minimum of -1.22 and a maximum of 2.27 (see Table 1). The data source for both of these neighborhood characteristics is the 1998 Residential Environment Data Base.¹³

Multilevel Models

Multilevel or hierarchical linear models are used to test the hypotheses (Goldstein, 1995; Snijders & Bosker, 1999). One advantage of multilevel models above traditional techniques such as ordinary least squares regression is that they take into account the layered (nested) structure in the data. In our study, we are dealing with three levels, the level of the individual resident, the level of the neighborhood where the victim lives, and the level of the city in which the neighborhood is located. Measuring errors are specified at each of the three levels. In this way, the error term is estimated to take into account the possibility that individuals within neighborhoods and cities are more alike (e.g., might have more similar attitudes toward the police) than individuals between neighborhoods and cities. Another advantage of multilevel models is that in estimating the parameters, the number of individuals in a neighborhood and city is taken into consideration. Neighborhoods with numerous victims weigh more heavily in the parameter estimation than neighborhoods with only a few victims.

Because the dependent variable—whether or not a citizen is murdered—is a dichotomous measure, we estimate logistic regression multilevel models with the variance parameter at the level of the crime (victim) set at one. The parameters are estimated using MLwiN 2.0, which has been especially developed for models of this kind (Rasbash et al., 2000). For a detailed explanation of the models used here, see Goldstein (1995) and Snijders and Bosker (1999).

The multilevel model is defined as follows. At the individual level, for each individual i in neighborhood j and city k , the log odds of being murdered versus not being murdered is given by the equation:

$$\text{Log}((\pi \times \text{Murdered}_{ijk}) / (1 - \pi \times \text{Murdered}_{ijk})) = \beta_{0jk} + \beta_1 \text{Female}_{ijk} \times \text{Age Group}_{ijk} + \varepsilon_{ijk} \quad (1)$$

where the individual-level variable for being a victim of murder, “Murdered_{ijk},” is coded (1) when the resident is a murder victim and (0) when they are not. In this equation, the β_{0jk} parameter represents the log odds for persons in the reference

group (for the present analyses, males in the age group, 20 to 30 years) of being murdered. This parameter is set as random at both of the higher levels—neighborhood and city. Thus, the parameter varies over neighborhoods and cities, implying that the risk of being murdered may differ among these three geographical units.

The risk of being murdered within neighborhoods, indicated by the β_{0jk} , is predicted in the following equation:

$$\beta_{0jk} = \gamma_{0k} + \gamma_1 \text{ Social Cohesion}_{jk} + \gamma_2 \text{ Socioeconomic Disadvantage}_{jk} + \gamma_3 \text{ Confidence in Police}_{jk} + \zeta_{jk} \quad (2)$$

This neighborhood-level equation contains the contextual neighborhood explanatory variables. The effects of these variables are assumed to be constant over the cities, therefore, only the intercept γ_{0k} is allowed to vary from city to city at the city level:

$$\gamma_{0k} = \kappa_0 + \theta_k \quad (3)$$

We include this third level to control for differences across cities that are not because of the variables included at the neighborhood level.

To obtain reasonable and interpretable parameter estimates, we centered the original neighborhood predictors in equation (2) around the national mean to establish a base-line for the location of the intercepts and the slopes in the multilevel equations (see Bryk & Raudenbush, 1992, pp. 25-29). By doing so, the intercept parameter in equation (1)—which is also the dependent variable in equation (2)—represents the mean risk of 20 to 30 year old males being murdered in the Netherlands between 1996 and 2003.

Findings

Geographical Variation in Absolute Homicide Rates

We first present a descriptive overview of the numbers of victims of homicide living in various municipalities and neighborhoods in the Netherlands. Thirty-nine percent of all 496 municipalities had no victims of homicide among their inhabitants in the past decade (1996 to 2003). One hundred and twelve municipalities saw one resident fall victim to homicide, the remaining 191 had more than one (Table 2), in most cases less than 20 homicides. Three municipalities recognized more than 100 victims among their inhabitants—obviously concentrated in the three largest cities of the country, Amsterdam (247), Rotterdam (221), and The Hague (129). Those three cities together were the sites for more than a third of all victims. The next largest community, Utrecht, displays a remarkably lower number of victims among its inhabitants (48), whereas the other municipalities in the Top 10 had between 25 and 40 victims each. The pattern is clearly visible on Map 1, in which we have color coded the number of victims per municipality: white areas had no victims, the darker the color indicates more victims live in an area.

Map 1
Number of Homicide Victims per City, the Netherlands, 1996 to 2003



Within municipalities, we again observe considerable differences between residential neighborhoods with respect to the likelihood of becoming a victim of homicide. We used a classification in neighborhoods based on the four-digit postal code, thus distinguishing 3,979 area units. The maximum number of victims living within such a neighborhood is 20. Three quarters of all neighborhoods did not have any victims among its inhabitants in the past 10 years (Table 2). Fourteen percent housed 1 victim, 11% had more than 1 victim.

Table 2
Distribution of Homicides Over Cities and Neighborhoods

Number of Homicides	Cities		Neighborhoods	
	<i>N</i>	%	<i>N</i>	%
0	193	39	2,998	75
1	112	23	548	14
2	65	13	223	6
3	32	6	96	2
4	23	5	48	1
5	9	2	24	1
6	8	2	15	0
7	3	1	7	0
8	5	1	5	0
9	4	1	4	0
10	4	1	3	0
11 to 20	23	5	8	0
21 to 30	6	1	0	0
31 to 50	6	1	0	0
51 to 100	0	0	0	0
101 to 200	1	0	0	0
201 to 250	2	0	0	0
Total <i>N</i>	469	100	3,979	100

Homicide victimization is clearly associated with size of a municipality (Table 3): 80% of all neighborhoods in the smallest municipalities (less than 50,000 inhabitants) had no victims at all, whereas in municipalities with 50,000 up to 250,000 inhabitants only half of the neighborhoods register no victims. In the four largest cities, only a third of all neighborhoods are victimless; and in those cities, the odds of observing multiple homicide victims in a neighborhood are largest.

However, also within large cities, we observe considerable differences. Map 2 exhibits, by color coding, the number of murders in the four largest cities in the Netherlands: Amsterdam, Rotterdam, The Hague, and Utrecht. The former three have a third of their neighborhoods with no residents murdered. In Utrecht, half of the neighborhoods have none. Neighborhoods with many murder victims are spatially clustered. Almost all Amsterdam high-murder neighborhoods are in the South-East area, Rotterdam sees a concentration of six such areas south of the river, in which more than 10 victims of violence died in the period studied.

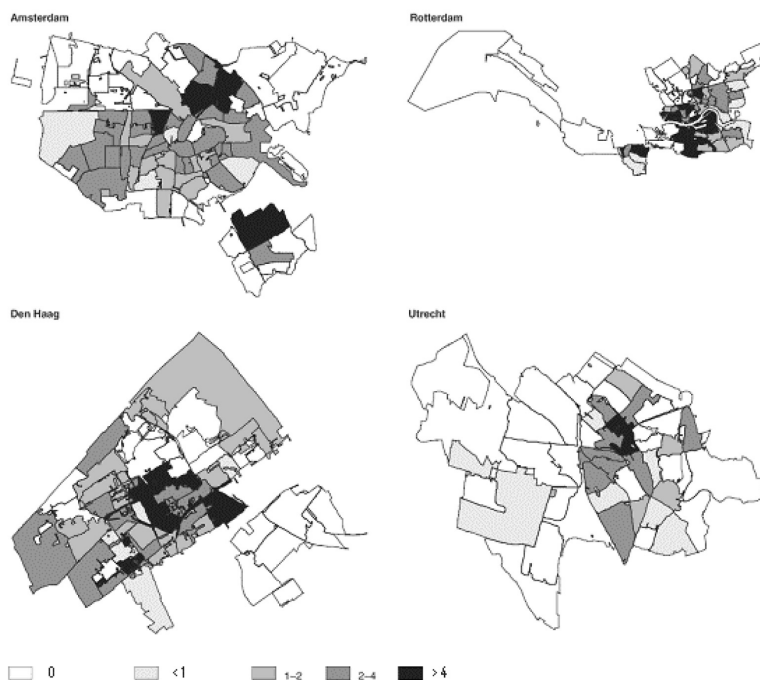
Multilevel Analyses

Our aim is to explain the geographical variation in homicide risk across neighborhoods and cities and to test the hypotheses we formulated on the contextual effects of social cohesion, confidence in the police, and socioeconomic disadvantage.

Table 3
Distributions of Neighborhoods on Number of Victims of Homicide and the Number of Residents
in the Cities Where the Neighborhoods Are Located

	Less Than 5,000 Residents	5,000 to <10,000	10,000 to <20,000	20,000 to <50,000	50,000 to <100,000	100,000 to <150,000	150,000 to <250,000	250,000 Residents or More	Total
0	97	91	88	82	62	56	51	36	75
1	3	8	10	13	18	20	24	14	14
2	—	1	1	4	11	15	14	13	6
3	—	—	0	1	5	4	6	11	2
4	—	—	—	0	2	4	3	7	1
5	—	—	—	0	1	0	2	5	1
6 to 20	—	—	0	0	0	1	0	14	1
Total number of neighborhoods	100	100	100	100	100	100	100	100	100
	39	244	965	1,493	495	260	226	257	3,979

Map 2
Number of Homicides (per 100,000 inhabitants) in Neighborhoods
in Four Major Cities in the Netherlands: Amsterdam,
Rotterdam, The Hague, and Utrecht, 1996 to 2003.



To examine the geographical variation in residents' risks of becoming a homicide victim, we of course have to take into account the number of inhabitants in each city and neighborhood. In addition, we have to take into account the composition of the population, for example, the sex and age distribution. That is, young men have relatively higher risks of being murdered. To take the composition of the population in each neighborhood and city into account, we use multilevel models (as discussed above), in which we analyze the risk of becoming a homicide victim for all 16 million inhabitants in the Netherlands assessing the risk based on the sex and age of individual residents.

Risk of Becoming a Victim of Homicide

We start with analyses for which the dependent variable is the risk of becoming a victim of homicide without making a distinction between different types of homicide. To adequately test our hypotheses, parameters for four logistic multilevel models have been estimated (see Table 4). Individual characteristics (i.e., sex and age combinations) are

Table 4

Effect Parameters (Log Odds Ratios) of Individual and Neighborhood Characteristics on the Probability of Being Murdered—All Homicides ($N_{\text{individuals}} = 16$ million; $N_{\text{neighborhoods}} = 3,979$; $N_{\text{cities}} = 496$)

	Model 1 Coefficient (SE)	Model 2 Coefficient (SE)	Model 3 Coefficient (SE)	Model 4 Coefficient (SE)
Intercept	-8.73 (0.08)**	-8.73 (0.08)**	-8.71 (0.08)**	-8.73 (0.08)**
Individual characteristics				
Male				
0 to 10 years	-1.30 (0.23)**	-1.31 (0.22)**	-1.27 (0.22)**	-1.26 (0.22)**
10 to 20	-1.05 (0.10)**	-1.06 (0.10)**	-1.03 (0.10)**	-1.02 (0.10)**
20 to 30 (reference category)	—	—	—	—
30 to 40	-0.04 (0.07)	-0.05 (0.07)	-0.03 (0.07)	-0.02 (0.07)
40 to 50	-0.21 (0.08)**	-0.23 (0.08)**	-0.19 (0.08)**	-0.19 (0.08)**
50 to 60	-0.44 (0.10)**	-0.46 (0.10)**	-0.43 (0.09)**	-0.42 (0.09)**
60 and older	-0.84 (0.13)**	-0.85 (0.15)**	-0.82 (0.13)**	-0.81 (0.13)**
Female				
0 to 10 years	-1.61 (0.18)**	-1.62 (0.18)**	-1.58 (0.18)**	-1.58 (0.18)**
10 to 20	-1.65 (0.19)**	-1.66 (0.18)**	-1.63 (0.18)**	-1.62 (0.18)**
20 to 30	-0.66 (0.11)**	-0.66 (0.12)**	-0.66 (0.11)**	-0.66 (0.11)**
30 to 40	-0.93 (0.16)**	-0.94 (0.16)**	-0.91 (0.15)**	-0.91 (0.15)**
40 to 50	-1.12 (0.15)**	-1.14 (0.15)**	-1.10 (0.14)**	-1.09 (0.14)**
50 to 60	-1.55 (0.16)**	-1.57 (0.17)**	-1.53 (0.16)**	-1.52 (0.16)**
60 and older	-1.44 (0.14)**	-1.45 (0.14)**	-1.42 (0.14)**	-1.41 (0.14)**
Neighborhood characteristics				
Percentage non-natives ^a	0.31 (0.04)**	0.42 (0.04)**	0.16 (0.02)**	0.13 (0.02)**
Residential mobility ^a	-0.02 (0.01)	-0.01 (0.01)	-0.06 (0.03)*	-0.09 (0.04)*
Low social cohesion	1.30 (0.22)**	0.54 (0.38)		0.74 (0.19)**
Confidence in police				0.34 (0.34)
Socioeconomic disadvantage ^a			0.34 (0.02)**	0.30 (0.03)**
Variance				
City level	0.07 (0.03)*	0.10 (0.04)*	0.01 (0.01)	0.00 (0.00)
Neighborhood level	0.30 (0.06)**	0.36 (0.07)**	0.18 (0.04)**	0.17 (0.04)**

a. Centered and divided by 10.

* = $p < .05$. ** = $p < .01$ (two-tailed).

included in all models as are the two control variables at the neighborhood level. In each of the first three models, the indicator of one of the neighborhood characteristics is also included. In the fourth model, all three indicators of the neighborhood characteristics are simultaneously included. The effect parameters are all shown in log odds ratios.¹⁴

Demographic characteristics of the individual residents are included in all models to test the net effects of neighborhood characteristics on the homicide risk. In other words, neighborhood effects are estimated controlled for the effects of individual characteristics. The estimated parameter effects in each of the models show that individual's sex and age are relevant for assessing the risk of becoming a victim of homicide. For all types of homicide, the parameters show the typical age-crime curve, that is, persons between 20 and 40 having the highest risk of being victimized. Furthermore, the parameters indicate that for all age groups, the homicide risks are higher for men than for women. In other words, when examining neighborhood effects, it is important that we control for these residents' characteristics. Importantly, the influence of individual characteristics remains virtually unaltered when different neighborhood characteristics are added to the model.

Model 1 addresses the relationship between a neighborhood's social cohesion and the probability that its residents become a victim of homicide. The parameter coefficient for the effect of low social cohesion is positive and statistically significant. This is a confirmation of our first hypothesis, in which we stated that lower social cohesion in a neighborhood is related to a higher probability that residents who live there will be murdered (H1).

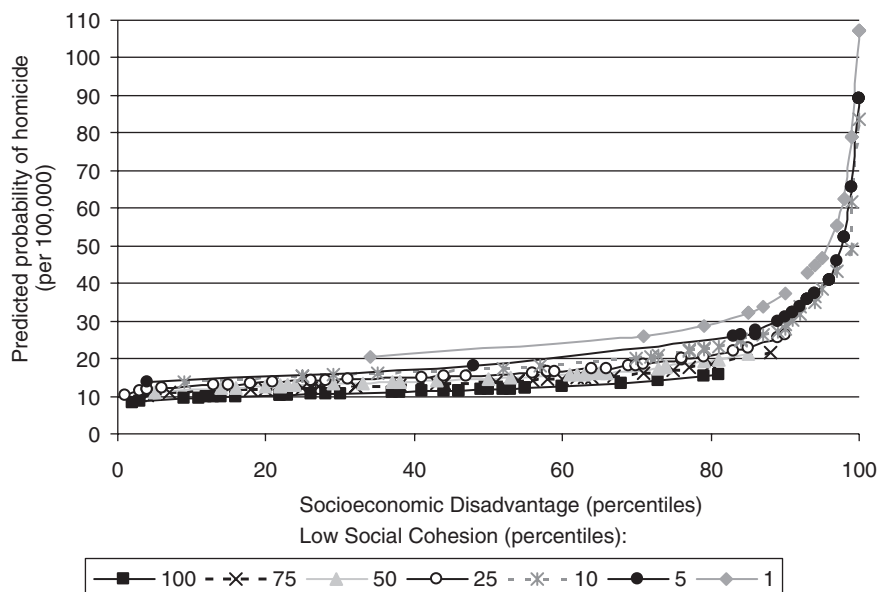
Our second hypothesis (H2) states that lower levels of confidence in police effectiveness in a neighborhood would result in a higher probability that residents who live there are being murdered. This hypothesis is not confirmed, as the parameter for the effect of confidence in police effectiveness is not significant (see Model 2 in Table 4).

Next, Model 3 tests the hypothesis that higher socioeconomic disadvantage in a neighborhood is related to a greater probability that residents living in these neighborhoods are murdered (H3). The parameter coefficient for this neighborhood characteristic is statistically significant and positive. Our third hypothesis is thus confirmed.

Last, we test the hypothesis that, in addition to the direct effect, socioeconomic disadvantage also is mediated by two intervening factors, namely the level of social cohesion and confidence in police effectiveness in neighborhoods (H4). Therefore, we estimated a model including all neighborhood characteristics (Model 4 in Table 4). As in Model 2, the parameter coefficient for confidence in police effectiveness is not significant. The positive effect of neighborhood social cohesion risk of homicide is smaller than in Model 1, but still significant. The positive parameter for the measure of socioeconomic disadvantage is also diminished from its effect in Model 3, but still significant. This provides support for H4.

Figure 1 displays the results of our analyses. The predicted probability that residents living in neighborhoods become a homicide victim is shown in this figure

Figure 1
Predicted Probability (per 100,000) of Being Murdered by
Neighborhood Socioeconomic Disadvantage for Different
Levels of Neighborhood Social Cohesion—for the Reference Group:
Men Between 20 and 30 Years of Age (Model 4)



against the socioeconomic disadvantage—in percentiles—of neighborhoods. Each horizontal line represents a specific percentile score for the level of social cohesion in the neighborhood. Only neighborhoods in the 1st, 50th, 90th, 95th, and 100th percentile of social cohesion are shown. The lines through the figure show the predicted probability. In neighborhoods with a limited socioeconomic disadvantage, the likelihood of getting murdered is approximately between 8 and 14 per 100,000 residents—depending on the level of social cohesion in these neighborhoods. This graphically displays the confirmation of our hypothesis that some of the effect of socioeconomic disadvantage is mediated by the level of social cohesion in a neighborhood. Figure 1 also shows that the more disadvantaged the neighborhoods, the higher the probability for residents living in these neighborhoods to be killed. This is especially the case if socioeconomic disadvantage is extremely high: In the neighborhoods in the highest 5 percentile, the probability of being murdered can be as high as 90 per 100,000 residents. In the most disadvantaged neighborhood, this probability is 107 per 100,000 residents. Clearly, after controlling for effects of social

cohesion, there remains a substantial direct effect of socioeconomic disadvantage on risk of homicide.

Risk of Becoming a Victim of a Specific Type of Homicide

Finally, we conducted similar analyses for four distinct types of homicides. We estimated parameter coefficients for the probability of becoming a murder victim (a) in the family domain, (b) in the criminal domain, (c) during an argument, and (d) in other circumstances (including sexual murders). We do not present all estimated effect parameters, but present only effect parameters for those neighborhood characteristics about which we formulated hypotheses (Table 5).¹⁵

The results of these analyses are similar to those obtained when analyzing all homicides (compare Table 4). Lower levels of social cohesion in a neighborhood significantly increase the probability that inhabitants of these neighborhoods become victims of all types of homicide—with the exception of being murdered during an argument. The police effectiveness in a neighborhood does not affect the probability of being murdered in any type of homicide. However, higher socioeconomic disadvantage in a neighborhood is related to a larger probability that residents living in these neighborhoods are murdered for all types of homicide.

Summary and Conclusion

Various criminologists have hypothesized that city and neighborhood characteristics—especially socioeconomic disadvantage, social cohesion, and confidence in the police—influence the likelihood that residents become victims of homicide. These hypotheses, however, have rarely been studied adequately: There are only very few studies that analyze data at the neighborhood level and those that do have limited measures of social cohesion. Furthermore, U.S. cities were the focus of all extant homicide studies about neighborhoods. This study examines the effects of neighborhood characteristics on the risk of becoming a victim of homicide in all neighborhoods in the Netherlands nationwide. Data from the Dutch Homicide Monitor 1996 to 2003 are used to test hypotheses deduced from social disorganization and strain theories.

The results show that in addition to crime and victim characteristics, neighborhood social cohesion and socioeconomic disadvantage affect homicide risks. Lower levels of social cohesion in a neighborhood significantly increase the probability that inhabitants of these neighborhoods are victims of all types of homicide—with the exception of murders occurring during the course of an argument. Higher levels of socioeconomic disadvantage in a neighborhood are also shown to be related to a greater probability that residents living in these neighborhoods are murdered for all types of homicide. The police effectiveness in a neighborhood does not affect the probability that residents who live there are being murdered in any type of homicide.

Table 5
Effect Parameters (Log Odds Ratios) of Neighborhood Characteristics on the Probability of Being
Murdered—Four Types of Homicide ($N_{\text{individuals}} = 16$ million; $N_{\text{neighborhoods}} = 3,979$; $N_{\text{cities}} = 496$)

	Homicide in the Family Coefficient (SE)	Homicide During Arguments Coefficient (SE)	Homicide in the Criminal Domain Coefficient (SE)	Other Homicides Coefficient (SE)
Bivariate analyses				
Model 1: Social cohesion	1.20 (0.33)**	1.39 (0.45)**	1.39 (0.38)**	1.84 (0.35)**
Model 2: Confidence in police	0.85 (0.59)	0.96 (0.72)	1.76 (0.92)	-0.46 (0.56)
Model 3: Socioeconomic disadvantage ^a	0.32 (0.05)**	0.43 (0.05)**	0.40 (0.04)**	0.33 (0.04)**
Multivariate analyses: Model 4				
Low social cohesion	0.70 (0.31)**	0.52 (0.39)	0.57 (0.32)*	1.26 (0.30)**
Confidence in police	0.43 (0.60)	0.53 (0.81)	1.67 (0.82)	-0.81 (0.54)
Socioeconomic disadvantage ^a	0.29 (0.05)**	0.41 (0.05)**	0.35 (0.05)**	0.28 (0.04)**
Percentage nonnatives ^a	0.15 (0.04)**	0.05 (0.04)	0.14 (0.05)**	0.08 (0.04)*
Residential mobility ^a	-0.18 (0.08)*	-0.12 (0.10)	-0.01 (0.02)	-0.05 (0.04)

Note: In all models, individual characteristics and “percentage non-natives” and “mobility” are included. See Table 4.

a. Centered and divided by 10.

* = $p < .05$. ** = $p < .01$ (two-tailed).

This study's findings are a clear corroboration of the theories of social disorganization theory and the strain/deprivation theory. The findings of our study using nationwide data from the Netherlands are consistent with those found in U.S. city studies. Although we *a priori* did not have theoretical arguments why the relationships between the levels of social cohesion and socioeconomic disadvantage and their homicide rates would be different in Dutch than in U.S. neighborhoods, the similarity of findings is of interest. The Netherlands is a country with a relatively low homicide rate. Homicides in the Netherlands are geographically equally distributed social circumstances. Furthermore, in our nationwide studies, many neighborhoods in rural areas are included (although one might argue that Dutch rural areas are not really rural to U.S. standards). In addition, we were able to distinguish between different types of homicides. Therefore, by analyzing neighborhood data from the Netherlands, the social disorganization and strain theories' hypothesized relationships were put to a relatively strong test. The theories and the hypotheses derived from them were clearly upheld. It of course will be of interest to see whether these theories and the hypotheses linking neighborhood characteristics with homicide risk will also be corroborated in future studies in other European and non-U.S. countries.

Although this study is exceptional in the fact that various hypothesizes on the relationship between characteristics of neighborhoods—especially their socioeconomic disadvantage, social cohesion, and confidence in the police—and the likelihood that residents living in these neighborhoods become victims of homicide are tested in a national-level study, admittedly, some limitations should be noted. A shortcoming of our data and modeling strategy is that we were able to include only two variables (age and sex) at the individual level—no other detailed information is available on the individuals' characteristics. Consequently, it remains unclear whether effects of neighborhood characteristics mean that places with high levels of disadvantage and low levels of social cohesion have higher homicide rates, or that people with high scores on disadvantage and low scores on social cohesion are more apt to be murdered. In comparison to most neighborhood-level studies, we are able to control for the effect of age and sex at the individual level on the likelihood of homicide victimization. It would have been ideal to include individual social economic status and social cohesion measures. Unfortunately, these measures are not available to us at the national level for all homicide victims and residents of neighborhoods. Future research should aim to include such measures on individual characteristics.

It is also essential for future research to devote more attention to the characteristics of neighborhoods where the homicides occur and where the homicide offenders live. The social disorganization and strain/deprivation theory tested in this article are developed to explain the conditions that influence one's motivation to deviate and were derived to explain variation in differences in offending risks (and not to explain victimization risks). Because our data only allowed us to use the residence of the victim as geographical information, we derived hypotheses explaining victimization risks. Because people spend most of their time in their neighborhood of residence

and victims often are murdered by neighbors or someone in reasonably close proximity, then the characteristics of the victims residential neighborhood provide measures of characteristics that relate also to places where homicides take place or where offenders live. On the other hand, people are also likely to work outside their neighborhoods or travel outside their neighborhoods for leisure activities, so the victims may find themselves in dangerous places that may not be characteristic of their own neighborhoods for which we base our contextual measures. So in future research, it would also be of value to take into account information on exact geographical locations and social characteristics of the crime scenes and offenders' residential neighborhoods.

We conclude with a suggestion for the direction that future research on neighborhoods and violent behavior could take.¹⁶ In current theoretical debates and empirical studies, the social disorganization theory and the strain/relative deprivation theory represent the core of the theoretical landscape that is typically offered up for neighborhood variation in lethal violence. As addition, we suggest that other theoretical arguments be considered, such as the possibility that contexts of low cohesion and/or high socioeconomic disadvantage give rise to a set of "codes" about how to carry oneself in interpersonal interaction in ways that might elevate the chances of getting harmed and even killed (see e.g., Anderson, 1999). Furthermore, other neighborhood characteristics could be considered as relevant. For example, the presence or prevalence of illicit drug markets in a neighborhood can provide an opportunity structure for crime as well as people willing and motivated to use violence. Broadening the theoretical approach of studies on neighborhoods and violence with such arguments and enriching empirical studies with adequate data on such factors would be an important development in future research.

Notes

1. This is in sharp contrast to the indicators of strain/deprivation used in current studies that employ various components in indexes such as measures of poverty, unemployment, income inequality, and racial segregation.

2. Other characteristics of the murders in the databank include the following: when and where (information about the site) the murder took place; the type of weapon used to commit the murder; the victim's and the perpetrator's age, sex, ethnicity, or nationality; the victim/offender relationship; and whether the murder was solved. For the solved murders, information regarding the sentences demanded by the public prosecutor as well as the sentences handed down by the courts is recorded.

3. The Dutch population has increased by almost 1 million since the beginning of the 1990s to 16.1 million in 2005.

4. These are stable areas, but because of the development of new suburbs, 60 new zip code areas have been introduced between 1995 and 2001.

5. These cases relate to murder of, for example, siblings, uncles, or aunts.

6. In the Dutch criminological literature, these are commonly referred to as "liquidations."

7. To be able to classify a murder into a category, information regarding the victim/offender relationship is required. In unsolved cases, this information is not available. Although it might have been possible to classify a portion of the unsolved cases—for example, contract killings—on the basis of information about the cause of death, the place of the crime, and background of the victim, we have decided not to do so to avoid distortion of the facts.

8. It is not unusual for explanatory characteristics of aggregate-level units to be highly correlated and their inclusion in multiple regression estimation may result in inefficient significance tests of parameter coefficients. The bivariate correlation between socioeconomic disadvantage and the percentage of non-Western immigrants is .71, the strongest correlation between the neighborhood characteristics. From collinearity tests in the regression analysis, the socioeconomic disadvantage appears to have the highest variance inflation factor (VIF) score of our neighborhood characteristics, that is, 2.49. The magnitude of this VIF is not great enough to indicate a collinearity problem in our model estimation (Belsley, Kuh, & Welsch, 1980).

9. The Police Population Monitor is the largest questionnaire survey on the subject related to public safety and crime in the Netherlands and also is one of the largest in the world. As the survey is conducted on such a large scale, regional comparisons can be made throughout the Netherlands at a detailed level. For this study, we combined the 1995, 1997, 1999, and 2001 data files to obtain a larger sample of respondents per neighborhood.

10. In fact, this was 14,000 Dutch guilders, because the euro was not yet introduced in 1998.

11. The factor loadings are respectively .76, .83, .86, and .79 with Cronbach's alpha equal to .76.

12. The non-Dutch resident respondents of Western descent (239 Belgians, 429 Germans, and 183 British) are categorized along with the native Dutch.

13. A remark is necessary on the years the data for the various characteristics are measured. Our dependent variable (homicide risk) is measured across an 8 year period that spans 1996 to 2003, yet our neighborhood measures are drawn from sources from 2002 (low social cohesion), 1998 (socioeconomic disadvantage), and 1995 to 2001 (confidence in the police). So there might be a problem of temporal sequencing and we cannot rule out the possibility of reciprocal effects (e.g., homicide risks for example driving out wealthier people). Data restriction, however, made us decide to use this data strategy: Because homicide is a rare event in the Netherlands, using homicide data from a single year would result in a very sparse data set. Furthermore, the data on the neighborhood characteristics unfortunately were limited to these specific years.

14. The intercepts in Table 4 show the probability measured in log odds that an individual in the reference category, that is, a man older than 60 years of age becoming a victim of a homicide.

15. The parameter effects of individual characteristics, percentage non-natives, and mobility are similar to those presented in Table 4.

16. We thank the anonymous reviewer of our article that raises this issue and for providing us with these ideas.

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Paul Nieuwbeerta is senior researcher at the Netherlands Institute for the Study of Crime and Law Enforcement in Leiden, Netherlands and professor of sociology in the Department of Sociology at the Utrecht University in Utrecht, Netherlands, and a member of the Interuniversity Centre for Social Science Theory and Methodology. His research interests include the development of crime over the life course, homicide, and international comparative research in criminal victimization.

Patricia L. McCall is professor of sociology in the Department of Sociology and Anthropology at North Carolina State University, Raleigh, N.C., United States. Her research is embedded in the study of crime and social control. Her most recent efforts involve the analyses of aggregate-level homicide and suicide rates, identifying social and economic factors that explain the variations in these phenomena across geographic locations and over time. Other areas of research include the following: modeling criminal careers, juvenile justice program effectiveness, projections of juvenile violent crime rates, and domestic violence case processing.

Henk Elffers is senior researcher at the Netherlands Institute for the Study of Crime and Law Enforcement in Leiden, Netherlands and professor of psychology and law in the Law Faculty at Antwerpen University, Antwerpen, Belgium. His research focuses on spatial aspects of crime, rational choice theory of rule compliance, statistics in the courtroom, and relationship between judges and the general public.

Karin Wittebrood is senior researcher at the Netherlands Institute for Social Research/SCP, The Hague. Her research focuses on crime in urban cities. Her interests include crime victimization, fear of crime, contextual effects of neighborhood characteristics, and the effects of restructuring neighborhoods.